

## **REMARKS**

Further and favorable reconsideration is respectfully requested in view of the foregoing amendments and following remarks.

### **Claim Amendments**

Claims 1 and 4 have been amended to recite “benzoic acid” rather than “toluic acid”. Support for this amendment is found in original claim 2.

Additionally, amended claim 1 recites only those limitations which were present in original claims 1 and 2, with the exception that “preparation” has been replaced with “composition”, and “aluminoxane part” has been replaced with “trimethylaluminum”.

### **Rejection Under 35 U.S.C. § 112, First Paragraph**

Claim 1 is rejected under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement. This rejection is respectfully traversed for the following reasons.

#### **A. Limitation (i) of claim 1**

The polymethylaluminoxane is produced by hydrolysis or thermal decomposition from trimethylaluminum as a raw material. In general, the raw material trimethylaluminum is not completely consumed during the reaction, and accordingly, the resulting polymethylaluminoxane preparation of the invention of the above-identified application inevitably contains a mixture of pure polymethylaluminoxane configured by the -AlMe-O- structural units **and** remaining trimethylaluminum. Please see Fig. 1 below, as well as page 11, lines 18-22 of Applicants’ specification.

The methyl group in pure polymethylaluminoxane having the -AlMe-O- structural units is, as pointed out by the Examiner, derived completely from the raw material trimethylaluminum. However, as the polymethylaluminoxane preparation is a mixture of pure polymethylaluminoxane configured by the -AlMe-O- structural units and remaining trimethylaluminum, there is no contradiction in limitation (i) of claim 1, defined by the quantitative relationship between the methyl group from trimethylaluminum and that from polymethylaluminoxane preparation.

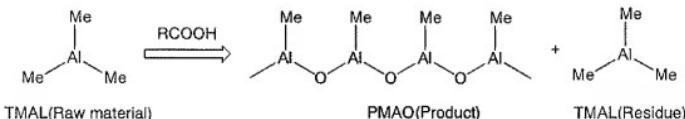


Fig. 1 Synthesis scheme of polymethylaluminoxane

In general, as shown in Fig. 2 below, trimethylaluminum can be coordinated to polymethylaluminoxane, functioning as a donor. Accordingly, it is believed that the quantitative comparison between the methyl group from polymethylaluminoxane and that from trimethylaluminum would be impossible.

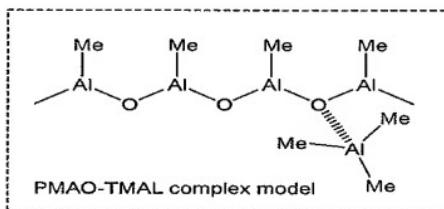
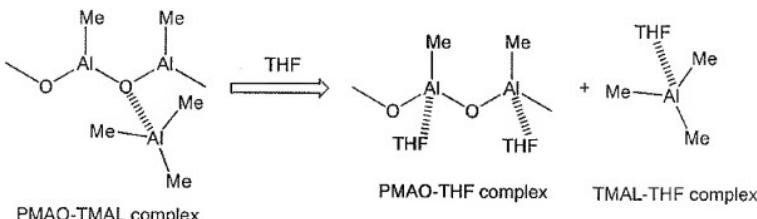


Fig. 2

However, if the coordination is broken, it would be possible to perform the quantitative evaluation by utilizing the electrical, stereospecific and chemical differences between polymethylaluminoxane and trimethylaluminum.



In accordance with the latest NMR technology, polymethylaluminoxane and trimethylaluminum can be distinguished from each other in terms of relative mass or quantitatively. Specifically, the method described in the article of Organometallics, Vol. 17, No. 10, pp.1941 - 1945, 1998 can be used for the purpose.

The separation of polymethylaluminoxane and trimethylaluminum from each other by THF coordination may be quantitatively achieved. This can be proven by the article described in Organometallics, Vol. 21, No. 21, pp. 4523- 4527, 2002, in that THF can have an ability to surely draw and remove trimethylaluminum coordinated to pure polymethylaluminoxane.

As described above, it is possible to determine the molar ratio between the methyl group from the polymethylaluminoxane preparation and that from the trimethylaluminum. Accordingly, Applicants respectfully assert that the position of the Examiner is untenable, and this portion of the rejection should be withdrawn.

Applicants also note that the mol% of the methyl group from trimethylaluminum is the molar percent of the methyl group from trimethylaluminum with respect to the methyl group from polymethylaluminoxane preparation, as clearly defined in claim 1. As the polymethylaluminoxane preparation is a mixture of pure polymethylaluminoxane configured by the -AlMe-O- structural units **and** remaining trimethylaluminum, the number of moles of the methyl group from polymethylaluminoxane preparation is the sum of the number of moles of the methyl group from trimethylaluminum and the number of moles of the methyl group from polymethylaluminoxane. Accordingly, the mol% of the methyl group from trimethylaluminum can be determined by the following formula:

Mol% of methyl group from trimethylaluminum =

$$\begin{aligned} & [( \text{peak area of methyl group from trimethylaluminum} ) / \\ & ( \text{peak area of methyl group from trimethylaluminum} + \\ & \text{peak area of methyl group from polymethylaluminoxane} ) ] \\ & \times 100. \end{aligned}$$

B. Limitation (iii) of claim 1

Applicants respectfully assert that this portion of the rejection has been rendered

moot by the above-discussed claim amendments.

**Patentability Arguments**

The patentability of the present invention over the disclosure of the reference relied upon by the Examiner in rejecting the claim will be apparent upon consideration of the following remarks.

**Rejection Under 35 U.S.C. § 103(a)**

Claim 1 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Smith et al. (U.S. Patent No. 5,831,109). This rejection is respectfully traversed for the following reasons.

The Examiner states, in the third paragraph on page 5 of the Office Action, that it would have been obvious to a skilled artisan at the time the invention was made to modify Smith's disclosure of Examples 2 and 4 by replacing toluic acid with benzoic acid and using suitable amount of toluene to provide PMAO reaction mixture. However, Applicants' invention is not the mere use of toluic acid, the adjusting the aluminum concentration to an appropriate range by toluene.

Rather, Applicants focused their attention on the relationship between the stability of PMAO and the viscosity of the preparation, which had not yet been reported, and found that the stability of PMAO correlates with the viscosity, thereby completing the invention of the subject application. In addition to this, it is important to note that **Applicants have defined the viscosity range within which the generated PMAO can stably exist in the generated product.**

In Example 2 of Smith, a catalytic amount of PMAO is added to cause the reaction to proceed. In Comparative Example 9 of the subject application, it is clear that the addition of PMAO in a catalytic amount undesirably increases the solution viscosity so as to adversely affect the storage stability of the generated PMAO. Thus, it is obvious that, even if a skilled artisan were to modify Example 2 of Smith, Applicants' invention would not be completed.

Furthermore, Smith does not discuss or even suggest the stability issue, which is an important aspect of Applicants' invention. Rather, Smith only discloses the synthesis results in Example 4. In Smith's Example, the Al concentration of the obtained PMAO is as high as 13.5

wt% (as a calculated value). As discussed in Applicants' Declaration, submitted June 19, 2009, the PMAO obtained by the trace experiments of Smith's Example 4 had extremely low stability, even when it was diluted to lower the Al concentration.

Smith does not teach or suggest, in Examples 2 and 4, that the stability of the generated PMAO correlates with the solution viscosity.

As discussed above, one of ordinary skill in the art would not have been motivated to alter Examples 2 and 4 of Smith to arrive at Applicants' invention. Additionally, even if one were motivated to alter Examples 2 and 4 of Smith, it would have been difficult for one of ordinary skill in the art to arrive at Applicants' invention with any predictability. Accordingly, Applicants respectfully assert that the Examiner's rejection is untenable and should be withdrawn.

*Comments Regarding the Declaration filed June 19, 2009*

In item 7 on page 6 of the Office Action, the Examiner disregards Applicants' previously filed Declaration as deficient. Applicants respectfully request that the Examiner reconsider the Declaration, in view of the claim amendments discussed above, as well as the following comments.

Applicants attempted to strictly perform trace experiments of the cited references in order to obtain experimental data for the Declaration submitted June 19, 2009. However, as discussed in the Declaration, **the trace experiments were not able to be repeated**. It is conceivable that **the Examples in the reference involve flaws**, instead of Applicants' experiments containing flaws. Applicants have confirmed this assumption including reproducibility based on supporting data, in order to prepare the Declaration properly. Applicants have carried out various similar synthesis experiments including the present system, and found that it must be crucial flaws for the reaction, as the reaction did not proceed, even utilizing benzoic acid as an oxygen source while heating at 80°C for 20 hours.

Applicants respectfully assert that the results presented in the Declaration should be properly interpreted, and accordingly, Applicants assert that the result of Run 3 in the Declaration was not a failure. **The evaluation in the prior art that the stability was high was an error**. In conclusion, Applicants respectfully assert that the generated

polymethylaluminoxane in the prior art patent was not stable.

For the reasons set forth above, as well as those discussed in the previously submitted Declaration, it is evident that the subject matter of Applicants' claims is patentable over the cited reference. Thus, it is respectfully requested that the above-rejection be withdrawn.

**Conclusion**

Therefore, in view of the foregoing amendments and remarks, it is submitted that each of the grounds of rejection set forth by the Examiner has been overcome, and that the application is in condition for allowance. Such allowance is solicited.

If, after reviewing this Amendment, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, the Examiner is respectfully requested to contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

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